

CLAIMS

What is claimed is:

1. A diffraction grating element, comprising:
a base;
5 a first block affixed to the base and having a side beveled at a first angle
relative to a plane perpendicular to the base, the beveled side having a
grating ruled thereon; and
a second block affixed to the base and having a side beveled at a second angle
relative to the plane, the beveled side having a grating ruled thereon,
10 the beveled side of the second block facing the beveled side of the first
block, the first angle being equal but opposite in sign to the second
angle;
wherein the grating of the first block is aligned with the grating of the second
block so that the gratings are in phase.
- 15 2. A grating horn, comprising:
a flat base and a pair of grating elements attached to the base, each of the
grating elements being ruled with a grating period, the grating
elements oriented in phase and in substantial symmetry about a normal
to the flat base, such that an electron beam interacting with the grating
20 elements produces Terahertz radiation.
3. The grating horn of claim 2, the grating elements forming a V-groove
and vertex to the flat base.
4. The grating horn of claim 3, each of the grating elements being ruled
perpendicular to a face of the grating element.
- 25 5. The grating horn of claim 3, the vertex intersecting the flat base.
6. The grating horn of claim 3, the vertex non-intersecting the flat base,
wherein rulings of the grating elements extend between the vertex and the flat base.

7. The grating horn of claim 3, the vertex comprising a flat portion.
8. The grating horn of claim 3, wherein rulings of the grating elements are parallel to the flat base.
9. The grating horn of claim 3, wherein each of the grating elements
5 forms a bevel edge, wherein each of the grating elements is ruled between the bevel edge and the flat base.
10. The grating horn of claim 3, wherein each of the grating elements comprises a triangle component and a rectangular component, wherein each of the grating elements is ruled in the triangular and rectangular components and parallel to
10 the flat base.
11. A system for generating FIR laser radiation, comprising:
an electron source for generating an electron beam; and
a grating horn for interacting with the electron beam to produce the FIR laser radiation.
- 15 12. The system of claim 11, further comprising optics to focus radiation scattered from the grating into a laser beam.
13. The system of claim 11, further comprising a chamber for housing the grating, and a window for transmitting the FIR radiation from inside the housing to outside of the housing.
- 20 14. A system for generating FIR laser radiation, comprising:
an electron source for generating an electron beam; and
a plurality of gratings, each of the gratings being positionable to a focus of the electron beam to interact with the electron beam to produce the FIR laser radiation, each of the gratings being ruled differently to modify
25 emission wavelength of the FIR radiation.
15. The system of claim 15, one or more of the gratings comprising one of a grating horn and a planar grating horn.

16. A method for generating FIR radiation, comprising:
generating an electron beam; and
focusing the electron beam to a grating horn, wherein interaction between the
electron beam and the grating horn produces the FIR radiation.
- 5 17. The method of claim 16, further comprising focusing the FIR radiation
into a laser beam with one or more optical elements.
- 10 18. A system for exciting, modulating, stimulating particles, comprising:
a particle source for generating a particle beam; and
a coherent radiation source for emitting coherent radiation; and
optical elements to focus the radiation into a grating horn for interacting with
the particle beam so as to one or more of excite, modulate and
stimulate particles of the particle beam.